

# THE DISTRIBUTION OF THE NOTONECTIDAE (HEMIPTERA) IN SOUTH-EASTERN AUSTRALIA

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## SYNOPSIS

The distribution and relative abundance of species of Notonectidae found in south-east Australia are discussed. Fourteen species occur in this region, eleven in the genus *Anisops*, two in the genus *Enithares* and one in the genus *Paranisops*.

## INTRODUCTION

The Notonectidae ("back swimmers") are common in freshwater habitats of Australia, such as rivers, creeks, pools and waterholes. Several authors have discussed the taxonomy of the species found in Australia, including Kirkaldy (1897, 1904) and Hungerford (1934, 1940). Hale published several papers on the Notonectidae (1923, 1924, 1925). He described all the known Australian species, several of which were new, and established the genus *Paranisops*. Brooks (1951) revised the genus *Anisops* on a world basis and described twelve new species from Australia. He solved many taxonomic problems associated with this genus.

There are eight genera in the Notonectidae, five of which have been recorded from Australia. Australian species of *Nychia* and *Notonecta* have been described by Hale (1925) and Kirkaldy (1897), but they were not encountered during the course of this study. *Anisops*, *Enithares*, and *Paranisops* are the only genera known to occur in south-eastern Australia.

The distribution of the Australian Notonectidae is not well known and this paper describes the known distribution of species found in south-eastern Australia.

## MATERIALS AND METHODS

This study is based on specimens collected from more than 120 localities by the author and colleagues, during 1962 and 1963. The collection has since been deposited in the Macleay Museum, University of Sydney. The area visited includes most of New South Wales and Victoria, with some localities in the eastern part of South Australia, and Brisbane, Queensland. The Notonectid collections of the Australian and South Australian Museums were inspected but were not examined in detail.

Most specimens were preserved in 70% alcohol although representatives of each species were pinned. The technique adopted for the examination of the male foreleg of *Anisops* was that described by Brooks (1951). After removal from the insect the organs were cleared in 5% caustic potash solution and dehydrated in alcohol. Except where otherwise stated, specimens from the various localities mentioned in the text were collected by the author.

## Genus ANISOPS

*Anisops* is the dominant Notonectid genus in Australia and the following twenty-two species have been recorded from this continent :

<i>A. barrenensis</i> Brooks *	<i>A. malkini</i> Brooks *
<i>A. calcaratus</i> Hale †	<i>A. nasuta</i> Fieber *
<i>A. canaliculata</i> Brooks † *	<i>A. nodulata</i> Brooks *
<i>A. deanei</i> Brooks †	<i>A. occipitalis</i> Breddin *
<i>A. doris</i> Kirkaldy †	<i>A. ocellaris</i> Hale *
<i>A. elstoni</i> Brooks †	<i>A. paracrinata</i> Brooks *
<i>A. endymion</i> Kirkaldy	<i>A. semita</i> Brooks *
<i>A. evansi</i> Brooks ‡	<i>A. stali</i> Kirkaldy †
<i>A. gratus</i> Hale †	<i>A. tasmaniaensis</i> Brooks ‡
<i>A. hackeri</i> Brooks †	<i>A. thienemanni</i> Lundblad †
<i>A. hyperion</i> Kirkaldy †	<i>A. windi</i> Brooks *

\* North Australian species

† South-east Australian species

‡ Tasmanian species

Many of these species have been collected only in the far north, in the Cape York and Darwin areas. Ten of them were collected in the south-east of the continent during the present study, as well as *A. tahitiensis* which has not previously been recorded from Australia.

Only the males of the genus have reliable diagnostic characters. They can be distinguished from the females by the single tarsal segment of the foreleg and the lateral prongs on the third segment of the rostrum. A key to the genus *Anisops* was presented in Brooks' (1951) paper, but as this includes almost eighty species it was felt that a simplified key of the local species would be of some value.

Key to males of south-east Australian *Anisops*

1. Small species, less than 5 mm. in length ..... 2  
Larger species, greater than 5 mm. in length ..... 3
2. (1) Facial tubercle \* with a median groove, without median depression of pronotum ..... *A. canaliculata*  
Facial tubercle without median groove, with median depression of pronotum ..... *A. elstoni*
3. (1) Greatest width of head slightly greater than width of pronotum ..... *A. doris*  
Greatest width of head less than width of pronotum ..... 4
4. (3) Large species greater than 8 mm. in length ..... 5  
Medium-sized species less than 8 mm. in length ..... 6
5. (4) Vertex † extends beyond eyes into a cephalic horn, without spur on tibia of foreleg ..... *A. stali*  
Vertex not extended beyond eyes, with spur on tibia of foreleg ..... *A. calcaratus*
6. (4) Dorsal surface of pronotum with a median depression ..... *A. gratus*  
Dorsal surface of pronotum without median depression ..... 7
7. (6) Facial tubercle raised into a median carina ..... *A. tahitiensis*  
Facial tubercle not raised into a median carina ..... 8
8. (7) Front femur broad; dorsal and ventral margins almost parallel for basal three-fourths of its length ..... *A. thienemanni*  
Dorsal and ventral margins of front femur not parallel ..... 9
9. (8) Apex of third rostral segment wider than base of fourth segment ..... *A. deanei*  
Apex of third rostral segment equal to base of fourth segment ..... 10
10. (9) Anterior tarsus with a median row of five setae ..... *A. hyperion*  
Anterior tarsus with more than five setae in two rows ..... *A. hackeri*

\* Facial Tubercle: The modified region of the space between the eyes, immediately above the labrum.

† Vertex: The anterior dorsal margin of the space between the eyes.

## ANISOPS THIENEMANNI Lundblad

(Fig. 1a)

This is the most common and widespread species in south-east Australia and is most abundant on the western plains of New South Wales. It also occurs on the slopes and tablelands of the Great Dividing Range but is rare on the east coast, having been collected from only two localities in that area (Morwell and Narooma).

*Localities* :—NEW SOUTH WALES : Hartley, 5/8/62 ; Narooma, 30/12/62 ; Goulburn, 26/12/62 ; Lake Bathurst (W. Williams), Jan. 1962 ; Canberra, A.C.T., 26/12/62 and 20/1/63 ; Gunning, 20/8/62 ; Taralga, 4/8/62 ; Cooma, 26/12/62 ; Thredbo, Crackenback River, 28/12/62 ; Glanmire, 11/8/62 ; Koora-watha, 16/1/63 ; Wellington, 28/8/62 ; Forbes, 26/4/62 ; Young, 16/1/63 ; Brungenbrong, 19/1/63 ; Gulargambone (J. Anderson), 26/12/62 ; Coonabarabran (J. Bishop), 28/6/62 ; Warren (P. Bailey), 30/6/62 and (J. Bishop), 12/8/62 ; Wagga Wagga, 16/1/63 ; Yerong Creek, 16/1/63 ; West Wyalong, 25/4/62 ;



Fig. 1. Distribution of a, *A. thienemanni* ; b, *A. deanei* ; c, *A. hyperion* ; d, *A. stali*.

Leeton, 23/4/62 ; Yenda, 22/4/62 ; Lake Cargelligo (J. Bishop), June, 1962 ; Cobar, 27/8/62 ; Nyngan, 1/7/62 ; Bourke (J. Bishop), 5/7/62 ; Wilcannia, Caltigena Tank, 27/8/62 ; Menindee, 26/8/62 ; Euston, 22/8/62. VICTORIA : Sale, 18/1/63 ; Morwell, 18/1/63 ; Nareil, 19/1/63 ; Benambra, 19/1/63 ; Mt. Hotham (W. Williams), Jan. 1962 ; Violet Town, 16/1/63 ; Winton, 16/1/63 ; Wungnhu, 21/8/62 ; Echuca, 21/8/62 ; Lake Cooper (W. Williams), Jan. 1962 ; Nyah, 22/8/62 ; Hattah Lakes (W. Williams), 27/8/62 ; Lake Hindmarsh (W. Williams), Jan. 1962 ; Casterton (W. Williams), 19/8/61 ; Hamilton (W. Williams), Jan. 1962. SOUTH AUSTRALIA : Mingary, 28/8/62 ; Oodla Wirra, 25/8/62 ; Truo, 23/8/62 ; Sheoak Log, 23/8/62.

## ANISOPS DEANEI Brooks

(Fig. 1b)

A common species, particularly on the coast. It is often found on the slopes and tablelands but rarely occurs on the inland plains.

*Localities* :—NEW SOUTH WALES : Bulahdelah, 22/8/62 ; Raymond Terrace, 22/8/62 ; Marsden Park, 24/6/62 ; Waterfall, 5/5/62 ; Narooma, 30/12/62 ; Bemboka, 29/12/62 ; Milton, 30/12/62 ; Nimmitabel, 29/12/62 ; Kanangra Walls, 20/1/63 ; Goulburn, 26/12/62 ; Collector, 20/1/63 ; Gunning, 20/8/62 ; Cooma, 26/12/62 ; Berridale, 19/1/63 ; Jindabyne, Saw Pit Creek, 27/12/62 ; Glanmire, 11/8/62 ; Wellington, 28/8/62 ; Cootamundra, 16/1/63 ; Forbes, 26/4/62 ; Gulargambone (J. Anderson), 24/4/62 ; Gilgandra, Castlereagh River (J. Bishop), 29/6/62 ; Trangie, 27/8/62 ; Warren (P. Bailey), 30/6/62 ; Young, 16/1/63 ; Yerong Creek, 16/1/63 ; Mullengandra, 20/8/62 ; Nyngan, 1/7/62 ; Hermidale, 27/8/62 ; Leeton, 23/4/62. VICTORIA : Bairnsdale, 18/1/63 ; Nareil, 19/1/63 ; Chiltern, 16/1/63 ; Morwell, 18/1/63 ; Heyfield (W. Williams), 25/11/62 ; Violet Town, 16/1/63. SOUTH AUSTRALIA : Oodla Wirra, 25/8/62 ; Burra, 25/8/62 ; Sheoak Log, 23/8/62. QUEENSLAND : Brisbane, 27/5/62 ; Petrie, 31/5/62.

## ANISOPS HYPERION Kirkaldy

(Fig. 1c)

The distribution of *A. hyperion* is similar to that of *A. thienemanni*. It is rare on the coast but common on the slopes and ranges and also occurs on the western plains, though not as frequently as the latter species.

*Localities* :—NEW SOUTH WALES : Mittagong, 3/8/62 and 20/8/62 ; Kanangra Walls, 20/1/63 ; Goulburn, 26/12/62 ; Gunning, 20/8/62 ; Collector, 20/1/63 ; Canberra, A.C.T., 20/1/63 ; Glanmire, 11/8/62 ; Bathurst, 28/8/62 ; Manildra (J. Bishop), June 1962 ; Forbes, 26/4/62 ; Trangie, 27/8/62 ; Warren (J. Bishop), 12/8/62 ; West Wyalong, 25/4/62 ; Yerong Creek, 16/1/62 ; Mullengandra, 20/8/62 ; Bourke (J. Bishop), 5/7/62 ; Cobar, 27/8/62 ; Mount Hope (J. Bishop), June, 1962 ; Wilcannia, 27/8/62. VICTORIA : Bairnsdale, 18/1/63 ; Benambra, 19/1/63 ; Chiltern, 16/1/63 ; Violet Town, 16/1/63 ; Winton, 16/1/63 ; Glenrowan, 16/1/63 ; Yarrawonga, 21/8/62 ; Wungnhu, 21/8/62 ; Echuca, 21/8/62. SOUTH AUSTRALIA : Oodla Wirra, 25/8/62 ; Sheoak Log, 23/8/62.

## ANISOPS STALI Kirkaldy

(Fig. 1d)

*A. stali* is most common on the inland plains of New South Wales and similar areas of the surrounding States. It has been collected near the coast (Wingham and Bemboka) and on the western slopes of the Dividing Range. Altitude may be a factor affecting the distribution of this species as it has not been found in the higher areas of this region.

*Localities* :—NEW SOUTH WALES : Wingham, Jan., 1962 ; Bemboka, 29/12/62 ; Cudgegong River (J. Bishop), 5/11/62 ; Cootamundra, 16/1/63 ; Junee, 16/1/63 ; Gulargambone (J. Anderson), 24/4/62 ; Wellington, 28/8/62 ; Coonabarabran (J. Bishop), 28/6/62 ; Trangie, 27/8/62 ; Warren (P. Bailey), 30/6/62 and (J. Bishop), 12/8/62 ; Lake Cargelligo (J. Bishop), June, 1962 ; Hermidale, 27/8/62 ; Mount Hope (J. Bishop), June, 1962 ; Cobar, 27/8/62 ; Wilcannia, 26/8/62 ; Menindee, 26/8/62 ; Euston, 22/8/62. VICTORIA : Chiltern, 16/1/63. SOUTH AUSTRALIA : Oodla Wirra, 25/8/62.

## ANISOPS CALCARATUS Hale

(Fig. 2a)

This species is uncommon and is found mostly in the arid inland areas. It appears to have a distribution similar to *A. stali*.

*Localities* :—NEW SOUTH WALES : Canberra, A.C.T., 20/1/63 ; Manildra (J. Bishop), June, 1962 ; Wellington, 28/8/62 ; Coonabarabran (J. Bishop),

28/6/62 ; Cootamundra, 16/1/63 ; Junee, 16/1/63 ; Trangie, 27/8/62 ; Hermidale, 27/8/62 ; Cobar, 27/8/62 ; Menindee, 26/8/62. VICTORIA : Bairnsdale, 18/1/63 ; Chiltern, 16/1/63. SOUTH AUSTRALIA : Oodla Wirra, 25/8/62.

#### ANISOPS ELSTONI Brooks

(Fig. 2b)

This is a comparatively rare species. It has been collected from several localities near Sydney but does not occur far inland. (The most westerly collection was made at Narrandera, N.S.W.)

*Localities* :—NEW SOUTH WALES : Badgery's Creek, 7/8/62 ; Marsden Park, 1/7/62 ; Raymond Terrace, 22/8/62 ; Narooma, 30/12/62 ; Valley Heights, 5/8/62 ; Mittagong, 3/8/62 ; Narrandera, 25/4/62. VICTORIA : Benambra, 19/1/63 ; Winton, 16/1/63.



Fig. 2. Distribution of a, *A. calcaratus* ; b, *A. elstoni* ; c, *A. gratus* ; d, *A. hackeri*.

#### ANISOPS GRATUS Hale

(Fig. 2c)

This uncommon species occurs throughout the inland plains. It has not been collected on the coast or tablelands.

*Localities* :—NEW SOUTH WALES : Yerong Creek, 16/1/63 ; Leeton, 23/4/62 ; Nyngan, 1/7/62 ; Wilcannia, 26/8/62. VICTORIA : Nareil, 19/1/63 ; Yarrowonga, 21/8/62. SOUTH AUSTRALIA : Oodla Wirra, 25/8/62 ; Burra, 25/8/62.

## ANISOPS HACKERI Brooks

(Fig. 2d)

This species is uncommon in south-eastern Australia but it is the dominant Notonectid of the Brisbane area. Its distribution seems confined mainly to the north-east of the region.

*Localities* :—NEW SOUTH WALES : Bulahdelah, 22/8/62 ; Raymond Terrace, 22/8/62 ; Kanangra Walls, 20/1/63 ; Forbes, 26/4/62 ; Gulargambone (J. Anderson), 24/4/62. QUEENSLAND : East Ithaca Creek, Brisbane, 24/5/62 ; Upper Brookfield, Brisbane, 30/5/62 ; Toowong Creek, Brisbane, 26/5/62 ; Ferny Grove, 27/5/62 ; Petrie, 31/5/62.

## ANISOPS DORIS Kirkaldy

(Fig. 3a)

This is a rare species with distribution similar to *A. hackeri*. It is common in Hawkesbury Sandstone creeks in the Sydney area where it is often found in association with *P. inconstans*.

*Localities* :—NEW SOUTH WALES : Booral, 22/8/62 ; Waterfall, 5/5/62 ; Appin, March, 1962 ; Picton Lakes, 7/10/62 ; Manilla (J. Bishop), 25/6/62 ; Cudgegong, 5/11/62 ; Warren (P. Bailey), 30/6/62. QUEENSLAND : Upper Brookfield, Brisbane, 30/5/62.

## ANISOPS CANALICULATA Brooks

(Fig. 3a)

The type locality of this species is Barron River, North Queensland. It has only been collected by the author at Petrie, Queensland, and may be a "northern" species whose distribution extends as far south as this locality.

*Localities* :—QUEENSLAND : Petrie, 31/5/62.

## ANISOPS TAHITIENSIS Lundblad

(Fig. 3a)

This species has been found in New Guinea, the New Hebrides and the Solomon Islands (Brooks, 1951 ; Lansbury, 1963) but has not previously been recorded from Australia. It is common in the Brisbane area and probably occurs in other localities in Queensland and northern New South Wales.

*Localities* :—QUEENSLAND : East Ithaca Creek, Brisbane, 24/5/62 ; Toowong Creek, Brisbane, 26/5/62 ; Ferny Grove, 27/5/62 .

## Genus ENITHARES

More than 40 species in this genus are distributed through Africa and southern Asia (Hungerford, 1956). Two species have been recorded from this country, both of which occur in south-eastern Australia.

*Key to Australian Enithares*

1. Vertex not extended markedly beyond the eyes in both sexes, narrow ridge of ventral abdominal keel, males without spur on anterior trochanter ..... *E. bergrothi*
2. (1) Vertex extended markedly beyond eyes in both sexes, broad ridge of ventral abdominal keel, males with spur on anterior trochanter ..... *E. hackeri*

## ENITHARES BERGROTHI Montandon

(Fig. 3b)

This is a common species with a distribution similar to *A. deanei*. It is found on the east coast as well as the tablelands and slopes but is rare on the western plains.

*Localities* :—NEW SOUTH WALES : Raymond Terrace, 22/8/62 ; Waterfall, 5/5/62 ; Valley Heights, 5/8/62 ; Manilla, 25/6/62 ; Richlands, 4/8/62 ; Taralga, 4/8/62 ; Canberra, A.C.T., 20/1/63 ; Glanmire, 11/8/62 ; Cudgegong, 5/11/62 ;

Cowra, 16/1/63 ; Gulargambone (J. Anderson), 24/4/62 ; Mullengandra, 20/8/62 ; Wagga Wagga, 16/1/63. VICTORIA : Tambo River (W. Williams), 23/2/62 ; Morwell, 18/1/63 ; Chiltern, 16/1/63 ; Winton, 16/1/63 ; Wangaratta, 16/1/63 ; Dalyston (W. Williams), 2/9/62 ; Tallarook, 17/1/63 ; Kul Kyne (W. Williams), 27/8/61. SOUTH AUSTRALIA : Sheoak Log, 23/8/62. QUEENSLAND : East Ithaca Creek, Brisbane, 24/5/62 ; Toowong Creek, Brisbane, 26/5/62.

#### ENTHARES HACKERI Hungerford

(Fig. 3b)

This species is rare in south-eastern Australia and was only collected in three localities during this study. The type locality is Brisbane, Queensland.

*Localities* :—NEW SOUTH WALES : Manilla, 25/6/62 ; Leeton, 23/4/62. VICTORIA : Wangaratta, 16/1/63.

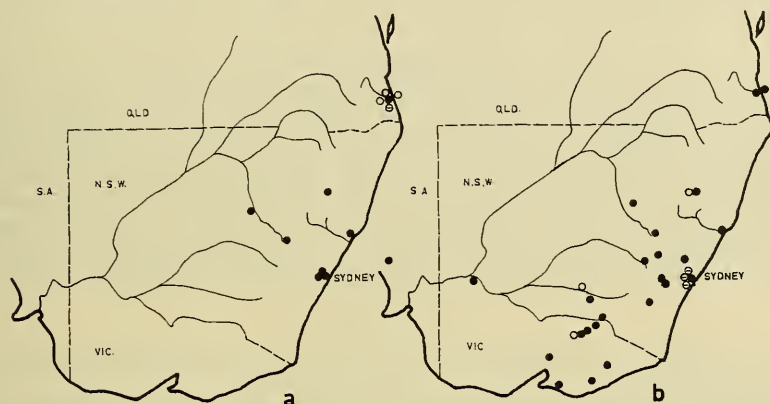


Fig. 3. Distribution of a, ● *A. doris*, ○ *A. tahitiensis*, ⊙ *A. canaliculata* ; b, ● *E. bergrothi*, ○ *E. hackeri*, ⊙ *P. inconstans*.

#### Genus PARANISOPS

This genus was established by Hale (1924) from specimens obtained at Epping, N.S.W. There is only one known species, *P. inconstans*, which is of special interest as it occurs in two distinct morphological forms. There is a black winged variety as well as a pale form which lacks functional hindwings. This species has only been found near Sydney (type locality) and Brisbane (Hungerford, 1934). Only the pale form, which is quite common in Hawkesbury Sandstone creeks around Sydney, was collected during this study.

#### PARANISOPS INCONSTANS Hale

(Fig. 3b)

*Localities* :—NEW SOUTH WALES : Waterfall, 5/5/62 ; Appin, March, 1962 ; Heathcote, March, 1962.

#### DISCUSSION

Most species of Notonectidae found in south-eastern Australia are more common within restricted areas of this region. Several species (*A. thienemanni*, *A. hyperion*, *A. stali*, *A. calcaratus* and *A. gratus*) are more prevalent on the inland plains and the slopes of the Great Dividing Range. Others (*A. deanei*, *A. elstoni*, *A. hackeri*, *A. doris* and *E. bergrothi*) have more easterly distributions and are usually found near the coast. *A. hackeri* and *A. doris* seem confined to the north-east.

Suitable aquatic habitats in inland areas usually consist of man-made dams and waterholes which are often isolated and many miles apart. The species found in these areas may have better dispersal powers than the "coastal"

species and thus be better adapted to invade an arid environment where habitats are widely separated. The other species may be limited to the coast and ranges where the heavier rainfall ensures an adequate supply of freshwater habitats.

Several species are often found together in the same locality. This is particularly so in western areas, where the scarcity of habitats may be responsible for this gregariousness.

There are several species of *Anisops* with type localities in North Queensland. *A. canaliculata* is the only one of these which has been found outside this area and is probably a "northern" species whose distribution range extends farther south than the others.

*P. inconstans* commonly occurs in Hawkesbury Sandstone creeks and seems rigidly restricted to this habitat as it has not been found elsewhere in the region. This limited distribution may be explained by the predominance of the pale form which is incapable of flight.

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